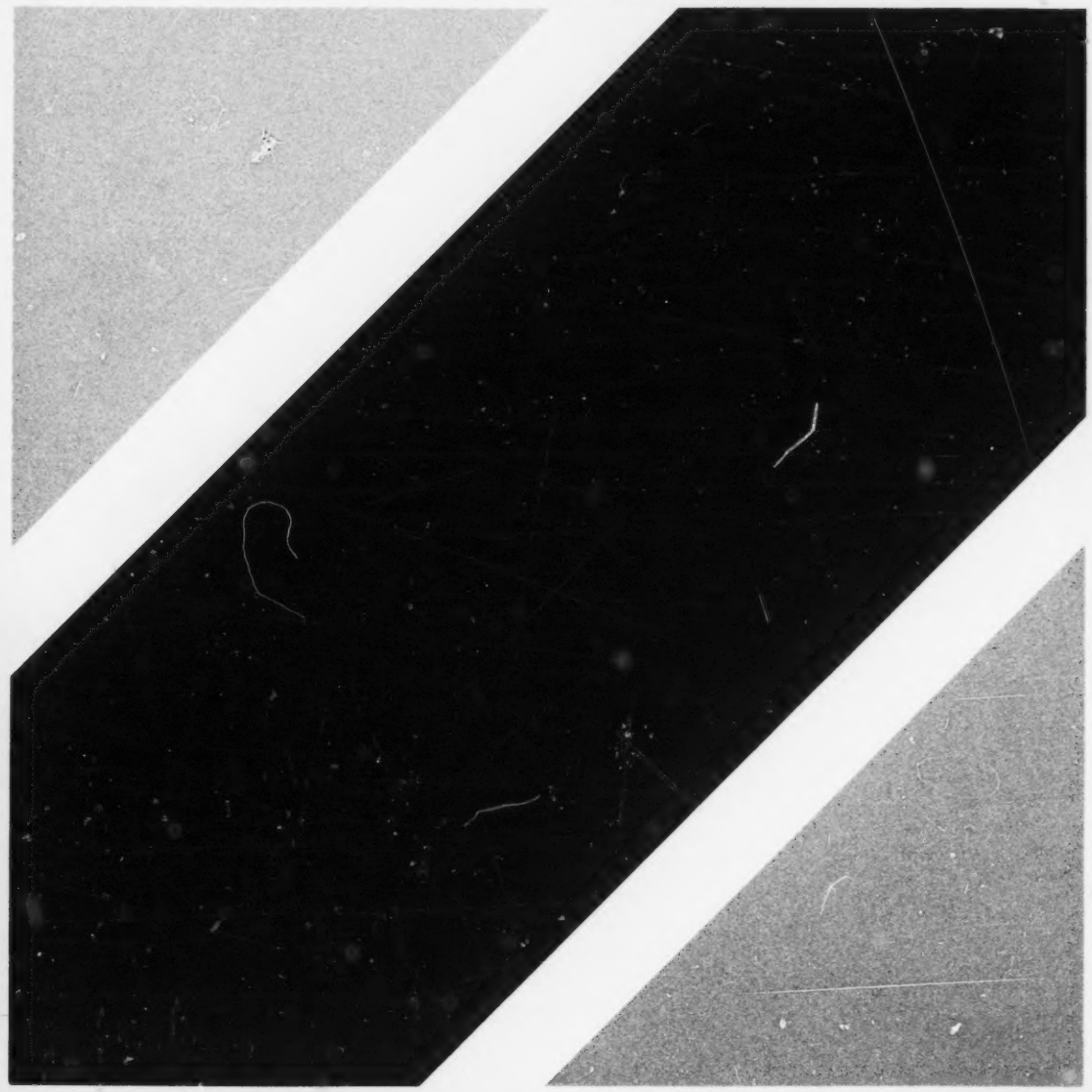
A9600-4 1

Annual Review 1979

U.S. ZINC and CADMIUM INDUSTRY

Including Statements from Other Countries



Review of Zinc in the United States in 1979

GENERAL SUMMARY

Preliminary estimates of the U.S. Bureau of Mines put the consumption of zinc in the United States at 1,111,359 short tons in 1979, a decrease of 46,711 tons or 4% from the final 1978 consumption of 1,158,090 tons. The 1979 consumption remained, however, slightly higher than the 1,101,765 tons of 1977. As in previous years, die casting accounts for the most significant portion of the 1979 decline due to downward fluctuations in the automotive industry. All other markets remained essentially stable or only slightly lower.

Use of zinc in the automotive industry, die casting's highest usage, declined because of several trends. The fuel economy standards mandated by the government have produced smaller and lighter passenger cars. Not only are cars smaller, fewer are being produced. Total production of autos fell from 12.9 million in 1978 to 11.5 million in 1979. Substitution and elimination of parts made of zinc plus increased use of ThinWall zinc die castings also are responsible for the decline. However, ThinWall technology has increased from only a few applications in 1974 to about 150 applications in the 1979 model cars and over 170 in the 1980 models. This includes optional equipment.

Galvanizing markets remained level with a slight drop in zinc usage of 1,942 tons from 500,464 in 1978 to 498,522 tons in 1979. Totals still represent a significant increase over the 1977 galvanizing consumption of 436,998 tons.

Use of zinc for brass again improved in 1979, climbing from 155,964 tons in 1978 to 157,137 tons in 1979.

Rolled zinc, zinc oxide and other uses, including zinc dust, batteries, desilvered lead, light metal alloys and other chemicals, remained stable.

Major market categories showed the following changes in 1979 consumption compared to the 1978 breakdowns. This includes allocation of 98,326 tons estimated unreported by the U.S. Bureau of Mines.

CONSUMPTION - SHORT TONS

	1978	1979
Galvanizing	500,464	498,522
Brass	155,964	157,137
Alloys (Die Casting)	390,365	350,634
Rolled Zinc	27,413	24,298
Zinc Oxide	41,008	39,147
*Other Uses	42,856	41,621
Total	1,158,070	1,111,359

*Dust, batteries, etc.

Consumption of zinc alloys for die casting may be broken out from slush, sand and rods as follows:

	1978	1979
Die casting alloys	381,364	344,715
Slush, sand and rod alloys	9,001	5,919
	390,365	350,634

Source: U.S. Bureau of Mines

Primary producers in the U.S. operated at an average 70% capacity during 1979. Year-end U.S. smelter stocks rose to 61,543 tons at the end of 1979 compared to 38,370 tons at the end of 1978. Producer stocks elsewhere fell from 22,631 end 1978 to 17,909 end 1979. Consumer stocks also were reduced from 109,487 tons end 1978 to 86,984 tons end 1979.

Domestic smelter production of slab zinc reached 537,424 tons in 1979, a 10% increase compared to 1978 production of 486,639 tons. Jersey Miniere Zinc Co. operated its new 90,000 ton per year electrolytic smelter in Clarksville, Tennessee for the full year. St. Joe Zinc Co. announced in November the permanent closing of its smelter in Monaca, Pennsylvania due to the high cost of energy, manpower and difficulty in meeting environmental regulations. St. Joe will, however, continue to operate its Balmat-Edwards zinc mines and concentrator in St. Lawrence County, New York. St. Joe's closing removed 250,000 tons of smelting capacity from the U.S. total bringing it to 567,000 short tons per year, according to the U.S. Bureau of Mines.

Smelter shipments also rose in 1979 to 514,254 tons over 1978's shipment total of 472,207 tons.

U.S. zinc mine production fell from 333,635 tons in 1978 to 290,703 tons in 1979. Strikes and a mine closure affected ore and concentrate production.

Exxon Minerals Company, U.S.A. continued development of its Crandon, Wisconsin zinc-copper deposit. Bulk sampling to assess mining conditions will begin in 1980. Exxon estimates the deposit to contain 5% zinc, 1.1% copper and other metals. Production could begin in 1987. Exxon also plans close-spaced drilling to determine zinc reserves at its Pinos Altos property in New Mexico. Louisiana Land and Exploration Co. and Superior Oil Company plan a joint venture to develop their Bald Mountain property in Maine if technical and environmental studies appear favorable. Noranda Exploration, Inc. plans to reopen the Ontario mine as part of its interest in Park City Ventures in Utah.

No exports of slab zinc were reported by the American Bureau of Metal Statistics but the U.S. Bureau of the Census reported 1979 exports at 346 tons.

Imports for consumption of zinc ores and concentrates increased from 207,373 in 1978 to 247,961 tons in 1979. Major sources were Canada, Mexico, Peru, Honduras and Bolivia. General imports of slab zinc were lower in 1979 at 581,148 tons as compared to 681,051 tons in 1978. Canada supplied 51% of the slab imports, with other major suppliers being Spain, Mexico, Australia, Finland and the Federal Republic of Germany. Increased imports of zinc to the United States came from Algeria, the United Kingdom and Japan, while fewer imports came from Finland, the Federal Republic of Germany, the Netherlands, France, Poland, the Republic of South Africa and Zaire.

Strong markets and high zinc prices on the London Metal Exchange increased the price of Prime Western Grade zinc from 34.5 cents per pound in early January to 41.5 cents by June. Reduced demand in the last half of the year brought prices down to 37.5 cents per pound. The average price for 1979 was 37.4 cents versus a 31.0 cent average for 1978. LME prices attained 36 cents in the first quarter but fell to 33.5 cents by year-end. LME stocks in January 1979 were 68,300 metric tons. They reached their highest level in mid-year, then gradually declined to 46,000 metric tons in late December. Prices at the New York Commodity Exchange followed the trend of Prime Western on the LME, rising to 38 cents per pound in June, then declining to 33.5 cents by December.

SUPPLY

Domestic mining for zinc in the U.S. produced 290,703 tons in 1979, a 42,932 ton decrease from 1978. Poor market conditions closed one mine and put another on standby. Strikes in New York, Missouri and Tennessee also accounted for lower production. Imports of zinc ore and concentrates rose 20%, from 207,237 tons in 1978 to 247,961 tons in 1979.

U.S. production of slab zinc increased 50,785 tons from 486,639 tons in 1978 to 537,424 tons in 1979. Imports of slab zinc for consumption fell, however, from 681,051 tons in 1978 to 581,148 tons in 1979.

Producer stocks of slab zinc at smelters and elsewhere and stocks at consumers changed as indicated in Table II:

Table II. PRODUCER AND CONSUMER ZINC STOCKS
(Tons of 2,000 lbs.)

	End 1978	End 1979
Producer Stock at Smelters	38,370	61,543*
Producer Stock Elsewhere	22,631	17,909*
Consumer Stock	109,487	86,984†

Source: †U.S. Bureau of Mines
*American Bureau of Metal Statistics

Producer stocks at smelters rose significantly from 38,370 tons year-end 1978 to 61,543 tons year-end 1979. Table I shows that producer stocks at smelters rose steadily throughout the year. Producer stocks elsewhere were reduced somewhat from 22,631 year-end 1978 to 17,909 year-end 1979. Consumer stocks fell 20% to 86,984 tons year-end 1979.

Shipments of slab zinc from U.S. producers to consumers rose 9% in 1979 to 514,254 tons over 472,207 tons in 1978.

The U.S. government stockpile goal remained unchanged at 1.31 million tons, of which 373,000 was on hand.

CONSUMPTION

The consumption of zinc in the United States was reported at 1,111,359 short tons by the U.S. Bureau of Mines, down 4% from the 1978 consumption of 1,158,070 tons.

Table III itemizes zinc consumption among its various general markets. In this table 98,326 tons of "Estimated unreported" from the U.S. Bureau of Mines have been allocated by Zinc Institute to end use markets, largely to galvanizing and die casting.

Using these estimates galvanizing went from 500,464 tons in 1978 to 498,522 tons in 1979, off merely 0.3%; zinc alloys consumed 350,634 tons in 1979 against 390,365 in 1978, down 10%; brass used 157,137 tons of zinc in 1979, up 0.8% over 155,964 tons in 1978; rolled zinc used 24,398 tons in 1979, off 11% from 27,413 tons in 1978; zinc oxide use declined 4% from 41,008 in 1978 to 39,147 tons in 1979; other uses, which include dust, batteries, desilvered lead, light metal alloys and chemicals declined 2% from 42,856 in 1978 to 41,621 in 1979.

Galvanizing markets remained steady through 1979. The largest markets for galvanized steel are commercial construction, tube and pipe, automotive, culvert and agriculture.

The Sixth Annual Zinc Institute Survey of the die casting industry reported 382,655 tons of zinc die castings shipped in 1979 as compared to the 344,725 tons reported by the U.S. Bureau of Mines. The Bureau's figure for 1979 includes an estimated 39,334 tons of zinc base alloy unreported to date. It has been felt that tonnage from non-reporting zinc alloy producers and users would add to the totals reported to the Bureau of Mines as consumed.

U.S. ZINC DIE CASTING TONNAGE
(Tons of 2,000 lbs.)

1979	382,655
1978	416,382
1977	418,319
1976	416,450
1975	405,750

Source: Zinc Institute Annual Survey

Zinc die casting's traditional number one market, automotive, is again dominant. At 165,761 tons, it represents 43.3% of the total 382,655 tons. Builders hardware retained second place 84,543 tons or 22.1% of the market in 1979. Electrical components remained in third place with 42,986 tons or 11.2% of the market. Industrial, agricultural and commercial machinery scored a substantial gain from 26,230 tons in 1978 to 29,763 tons in 1979 moving into fourth place with 7.8% of the market.

ZINC DIE CASTINGS USED IN AUTOMOTIVE COMPONENTS*
(Tons of 2,000 lbs.)

	tons
1979	165,761
1978	192,492
1977	205,801
1976	206,597
1975	213,974

*These figures represent zinc die casting tonnage shipped January to January including the automotive aftermarket as well as buses and trucks.

Source: Zinc Institute Annual Survey

WEIGHT OF ZINC IN THE AVERAGE CAR

	lbs. per car
1979	27.98
1978	30.02
1977	39.53
1976	44.84
1975	51.04

Source: Zinc Institute Annual Survey

Brass and bronze use of zinc improved in 1979. A good housing year helped to keep this tonnage healthy.

Rolled zinc at 24,298 tons in 1979 shows the increased use of aluminum and other competitive materials in its chief market: battery cans.

Lessened automobile production also affected the zinc oxide market which decreased from 41,008 tons in 1978 to 39,147 tons in 1979 since zinc oxide's largest market is in tires. A slight decrease also showed in the use of copy paper.

Detailed statistics on these markets for zinc are shown in Tables III through VI.

Statistics on zinc dust and zinc oxide are given in Tables VII and VIII, respectively.

TABLE III. U.S. SLAB ZINC CONSUMPTION BY MARKETS
(Tons of 2,000 lbs.)

	1975	1976	1977	1978	1979
Galvanizing	376,887	433,083	436,998	500,464	498,522
Brass	115,326	166,244	141,438	155,964	157,137
Alloys (Die Casting)	334,191	427,031	404,691	390,365	350,634
Rolled Zinc	27,308	29,859	30,210	27,413	24,298
Zinc Oxide	39,020	39,027	42,454	41,008	39,147
*Other Uses	32,598	38,897	45,974	42,856	41,621
Total	925,330	1,134,141	1,101,765	1,158,070	1,111,359

*Dust, Batteries, etc.

Source: U.S. Bureau of Mines

TABLE IV. CONSUMPTION OF SLAB ZINC FOR GALVANIZING
(Tons of 2,000 lbs.)

	1978	1979
Sheet and Strip	296,176	294,415
Wire and Wire Rope	25,134	25,021
Tube and Pipe	52,226	45,907
Fittings (for tube and pipe)	7,635	6,665
Tanks and Containers	3,192	3,707
Structural Shapes	36,667	23,932
Fasteners	5,334	4,796
Pole-Line Hardware	5,367	4,570
Fencing, Wire Cloth and Netting	27,554	17,207
Other and Unspecified Uses	41,179	27,068
Total	500,464	453,288
Estimated Undistributed		45,234
	Total	498,522

Source: U.S. Bureau of Mines

TABLE V. SALIENT STATISTICS SLAB ZINC-UNITED STATES
(Tons of 2,000 lbs.)

	1978	1979
U.S. Mine Production	333,635	290,703†
U.S. Slab Production	486,639	537,424†
Shipments from Smelters:		
Domestic	472,207	514,254*
Export	—	—
Total	472,207	514,254*
U.S. Government Stockpile Sales	—	—
Consumption	1,158,070	1,111,359†
Producers' Year End Stocks:		
Smelters	38,370	61,543*
Elsewhere	22,631	17,909*
Consumers' Stocks	109,487	86,984*
Imports for Consumption:		
Zinc Content of Concentrate	117,192	96,447†
Slab	686,155	577,749†

Source: †U.S. Bureau of Mines
*American Bureau of Metal Statistics

TABLE VI. U.S. SLAB ZINC CONSUMPTION BY GRADES
(Tons of 2,000 lbs.)

	1975	1976	1977	1978	(Preliminary) 1979
Special High Grade	438,173	551,270	543,047	541,590	489,146
High Grade	83,369	111,407	100,302	120,971	111,125
Intermediate	14,242	23,204	21,874	24,063	24,838
Brass Special	79,214	104,460	111,483	108,419	100,529
Prime Western & Select	309,564	342,538	323,710	361,206	382,859
Remelt	768	1,262	1,349	1,821	2,862
Total U.S.	925,330	1,134,141	1,101,765	1,156,070	1,111,359

Source: U.S. Bureau of Mines

TABLE VII. ZINC DUST
(Tons of 2,000 lbs.)

	1978	1979
Stock at Beginning	3,607	6,427
Production During Year	42,425	34,584
Shipments	39,585	35,861
Producer Stock at End	6,447	5,150

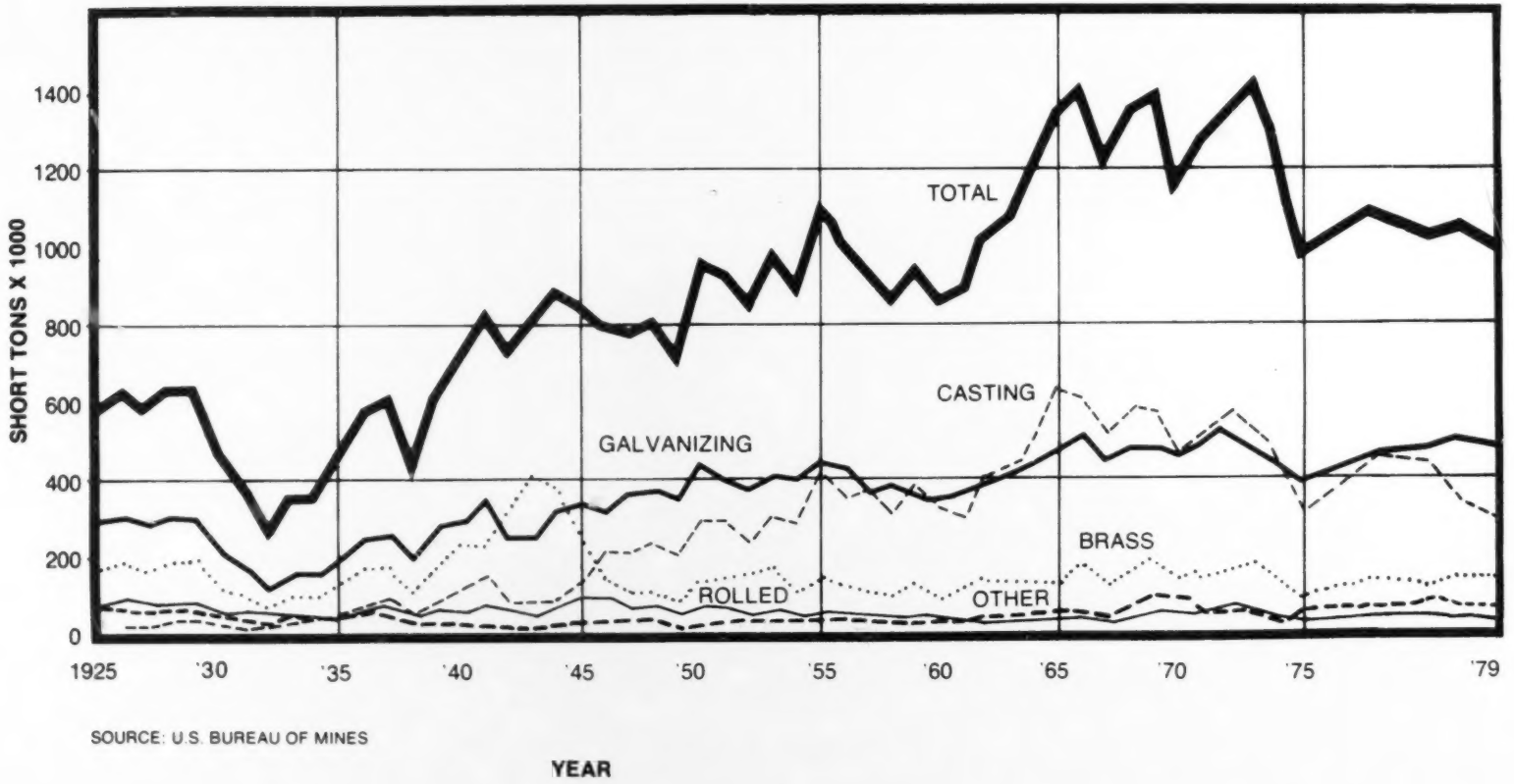
Source: U.S. Bureau of Mines

TABLE 1. TOTAL SLAB ZINC SMELTER OUTPUT REPORT
(ALL GRADES) Tons of 2,000 lbs.

	(1) PRODUCERS STOCK AT BEGIN.		(3)	(4) GSA METAL	(5) TOT.	(6)	(7) SHIPMENTS-INCLUDE GSA (Countries)	(8)	(9)	(10) PRODUCERS STOCK AT END		(12)	(13)
	Smelters	Elsewhere	Smelter Production Incl. GSA Metal	Purchased for direct Shipment	Available (1+3+4)	Domestic	Export+ OECD	Drawback Other	Total 6+7+8	Smelters 5 - 9	Elsewhere	Daily Avg. Prod.	GSA Metal Included in Col. (3)
1968	84,256	19,633	1,083,289			1,088,908	—	11,257	1,100,165	67,380	15,480		
1969	67,380	15,480	1,149,289			1,112,518	—	25,838	1,138,356	78,313	12,146		
1970	78,313	12,146	961,153			891,511	—	20,630	912,141	137,325	28,905		
1971	127,325	28,905	840,178			906,377	—	10,537	916,914	50,589	15,433		
1972	50,589	15,433	765,415	34,672	850,676	814,609	—	4,292	818,901	31,775	131,185		81,467
1973	31,775	13,185	687,861	54,917	774,553	726,531	1,130	17,599	745,260	29,293	4,287		11,907
1974	29,293	4,287	590,181	76,262	695,736	643,900	1,378	7,561	652,839	42,897	2,691		44,636
1975	67,449	22,691	445,916	443	513,808	421,747	—	60	421,807	67,449	22,040		3,688
1976	88,807	22,040	535,953	—	624,760	514,595	—	—	514,595	88,807	28,277		97
1977	65,787	51,956	434,054	—	499,841	457,074	—	—	457,074	65,787	51,956		—
1978	38,882	21,235	486,639		519,882	472,207							
1979													
Jan.	38,370	22,631	45,714	—	84,084	44,229	—	—	44,229	39,855	20,497	1,475	—
Feb.	39,855	20,497	46,113	—	85,968	47,949	—	—	47,949	38,019	15,402	1,647	—
Mar.	38,019	15,402	52,916	—	90,935	53,468	—	—	53,468	37,467	13,026	1,707	—
Apr.	37,467	13,026	51,130	—	88,597	44,098	—	—	44,098	44,499	11,292	1,704	—
May	44,499	11,292	49,870	—	94,369	47,669	—	—	47,669	46,700	11,519	1,609	—
June	46,700	11,519	42,953	—	89,653	44,510	—	—	44,510	45,143	15,127	1,432	—
July	45,143	15,127	44,016	—	89,159	37,388	—	—	37,388	51,771	11,210	1,420	—
Aug.	51,771	11,210	41,973	—	93,744	35,652	—	—	35,652	58,092	14,159	1,354	—
Sept.	58,092	14,159	39,796	—	97,888	40,345	—	—	40,345	57,543	10,044	1,327	—
Oct.	57,543	10,044	46,005	—	103,548	47,288	—	—	47,288	56,260	9,502	1,484	—
Nov.	56,260	9,502	43,427	—	99,687	33,729	—	—	33,729	65,958	12,556	1,448	—
Dec.	65,958	12,556	33,574	—	99,472	37,929	—	—	37,929	61,543	17,909	1,081	—
Year						537,427			514,254	514,254			—
Monthly Average						44,786			42,855	42,855			

Source: American Bureau of Metal Statistics

CONSUMPTION OF SLAB ZINC IN THE UNITED STATES



SOURCE: U.S. BUREAU OF MINES

TABLE VIII. PRODUCTION AND SHIPMENTS OF LEAD FREE ZINC OXIDE
(Tons of 2,000 lbs.)
(Both French and American Processes)

	Production	Shipments
1979		
American	107,519	108,896
French	64,095	67,248
Other*	13,359	13,358
	184,973	189,502
1978		
American	115,956	114,651
French	70,021	67,642
Other*	12,572	13,146
	198,549	195,439
1977		
American	116,835	118,050
French	67,455	67,863
Other*	16,429	16,297
	200,719	202,210
1976		
American	114,923	111,110
French	59,420	64,890
Other*	15,714	15,939
	190,057	191,939

*From residue and scrap

Source: U.S. Bureau of Mines

Note: French process zinc oxide is produced from slab zinc, remelt and scrap. American process is produced from ore and ore-scrap residues. All tonnages adjusted from preliminary data in previous Annual Reviews to final annual data from Bureau of Mines.

OUTLOOK

Early forecasts of a recession in 1980 have become a reality with housing starts predicted at a low one million and automotive production off 16%. Zinc's major markets of galvanizing and die casting alloys must necessarily fluctuate with these two industries. At an estimate of 50 pounds of zinc per vehicle (including die casting, galvanizing, zinc oxide and zinc plating) approximately 25,000 tons of zinc are used for every million vehicles produced. The implications of this are obvious.

High mortgage rates and tight money both will affect the affordability of homes, keeping housing starts very low and affecting zinc markets in galvanizing, brass and bronze and die casting for hardware.

Looking beyond the recession, the use of zinc certainly has a bright side for galvanized steel in the auto industry as anti-corrosion warranties are extended and durability becomes more important. Corrosion re-

sistant zinc coatings—one and two sided galvanizing, zinc rich paints and Zincrometal—will win zinc a large share of the automotive protection market as Detroit works to meet five year cosmetic and ten year perforation standards.

Galvanized steel will continue to be a premier choice for corrosion protection as corrosion maintenance costs of steel structures continue to increase at astronomical rates.

Predictions of a new housing boom in '83 and '84 will open up a great growth market in galvanized steel studs, joists and trusses. Ease and lower costs of construction, reliability and escalating lumber costs will bring many homebuilders to use steel framing.

Casting will remain strong in the 80's with zinc bidding for a larger share of the foundry alloy market in gravity and permanent mold castings. New technologies, such as computer aids for the die caster, will retain and expand the market for die castings in all applications.

Galvanized steel stampings present another growth market for zinc in providing increased durability and production cost savings to manufacturers.

Zinc may also prove to be an important material in solving some of the pressing energy problems. The zinc chloride battery, for example, has become a serious contender for widespread use in electric vehicle and utility load leveling applications.

Interest also has been expressed by the U.S. Mint in investigating the use of zinc for coinage.

ILZRO ZINC RESEARCH - 1979

ILZRO research and the Zinc Institute's marketing program helped usher in the computer age to zinc die casting in 1979. This was a highlight development in a year which also saw significant advances in galvanizing and in related corrosion prevention areas. Zinc chemicals in plastics, ceramics and paints were among other areas investigated by ILZRO in 1979.

In a cooperative effort with the ZI at the international meeting of the U.S. Society of Die Casting Engineers in St. Louis, Mo., in March 1979, ILZRO conducted the first public demonstration of a microcomputer program developed for the design of a runner, gate and overflow system. A low-cost (under $1,000) desk-top microcomputer, available worldwide, was used successfully to demonstrate the quick accuracy with which the gate, runner and overflow systems of a die casting die could be calculated, thereby eliminating the usual trial-and-error method. A few months later, ILZRO and ZI cooperated again in producing and publishing a manual explaining how to use the microcomputer to design the dies. The manual included a cassette tape of the program and seven commercial case histories of how the computer was used in designing specific die casting dies. While this first program was written in English units, work had begun before yearend on a metric unit version.

Further progress was achieved during the year on development of a portable minicomputer system for calibrating shot systems in die casting

machines. The advantages of this system include the fact that it can be programmed to make all of the necessary calculations to determine zinc flow rates over a wide range of feed-system parameters and can output those flow rates directly on an LED display for direct reading by the operator, thus eliminating the need to read complex data manually from traces and to plot flow-versus-pressure curves.

Several new applications were identified in a project to redesign automotive components through the use of zinc alloys and the zinc die casting process, as well as forgings, extrusions, sheet, and galvanized steel. A preliminary design of one application—a window regulator shaft—showed a weight reduction of 55% and a reduction in cost. The design was submitted (as were several others) to a major automobile manufacturer for further evaluation and comment.

In galvanizing, the major developments related to processes especially applicable to galvanizing of silicon-containing steels. A final report on a completed project shows that use of high-temperature galvanizing—galvanizing at 1022°F versus the conventional 842°F—is both technically and economically sound. The data will be incorporated in an ILZRO manual scheduled for publication in 1980.

In the second major galvanizing development, a pilot plant evaluation was initiated late in the year on a salt bath preheating system. In this system, the silicon-containing steels are first immersed in a preheated salt bath and then dipped in the zinc bath. The process improves quality and control of the galvanized coating and reduces zinc consumption, in addition to eliminating fumes and spatter.

Work also was initiated on a project to develop a zinc-aluminum coating that would contain less aluminum than that of Galvalume (Zincalume), which contains around 55% aluminum and 2% silicon. Development of a low Al-content zinc coating would show improved corrosion resistance in comparison to standard galvanizing zinc, a better sacrifical protection of steel than Galvalume, the possibility of being produced with minimal modification of existing galvanizing lines, and possess technological properties, such as formability and weldability, that would be similar if not superior to that of standard galvanized steel.

Work was concluded on a project that has seen zinc oxide established as a superior weathering stabilizer for plastics. In 1979, the bulk of the effort was directed to further field evaluations to identify optimum systems and to correlate actual weathering with the accelerated tests conducted previously in the laboratory. In the ceramics area, one project was directed to evaluating direct application of opaque coatings of zinc polyphosphate glass to metallic or masonry surfaces and another to a study of zinc oxide additions to improve the impact resistance of soda-lime-silica glasses, which represent about 90% of all glass melted.

The balance of this report consists of tables and statistics of zinc activities in the United States as well as a series of short reports submitted by a number of Zinc Development Associations from other countries.

TABLE IX. U.S. MINE PRODUCTION OF RECOVERABLE ZINC
(Tons of 2,000 lbs.)

State	1978	(Preliminary) 1979
Arizona	68	8
Colorado	24,480	11,133
Idaho	35,663	32,907
Kentucky	57	—
Missouri	65,078	66,919
Montana	87	146
Nevada	1,511	—
New Jersey	31,873	34,850
New York	w	w
Pennsylvania	21,053	21,880
Tennessee	96,900	92,865
Utah	3,868	1
Virginia	12,097	11,604
Other States 1)	40,902	18,394
Total 2)	333,635	290,703

Source: U.S. Bureau of Mines

w Withheld to avoid disclosing individual company confidential data; included in "other states."
1) Includes California, Illinois, New Mexico, New York, Texas, Washington and Wisconsin.
2) Data do not add to total shown because of independent rounding.

TABLE X. (SUPPLEMENTS TABLE I)
U.S. PRODUCTION OF SLAB ZINC ACCORDING TO GRADES
(Tons of 2,000 lbs.)

	1975	1976	1977	1978	1979
Special High Grade (99.99% Zn)	235,533	242,131	158,797	198,209	212,783
Regular High Grade	18,911	30,401	31,878	36,189	50,278
Intermediate	8,509	18,143	12,930	—	—
Prime Western (including Brass Special and Select)	182,963	245,278	230,449	252,241	274,366
Total	445,916	535,953	434,054	486,639	537,427

Source: American Bureau of Metal Statistics

TABLE XI. EXPORTS (DRAWBACK NOT INCLUDED)
(Tons of 2,000 lbs.)

	Slabs, Pigs & Blocks	Sheets, Plates, Strip or other forms N.E.S.*
1975	6,896	15,698
1976	3,513	10,537
1977	236	8,829
1978	852	2,680
1979	346	3,393

*Includes semifabricated forms N.E.S.

Source: Bureau of Census via American Bureau of Metal Statistics

TABLE XII. ZINC ORE GENERAL IMPORTS
(Tons of 2,000 lbs.) Zinc Content

	1975	1976	1977	1978	1979
Australia	4,044	2,291	4,343	2,041	779
Bolivia	1,217	785	4,991	438	13,155
Canada	98,700	69,901	58,578	157,980	158,685
Chile	—	—	11,784	6,540	1,367
Colombia	8	14	18	11	17
Costa Rica	—	—	851	—	—
Germany, Federal Republic of	20	231	812	7,204	8,598
Greenland	304	530	—	—	—
Honduras	13,362	16,307	17,369	14,486	14,750
Mexico	9,334	2,625	4,289	2,879	17,867
Nicaragua	7,299	3,637	3,051	4,460	4
Peru	4,902	794	1,034	11,087	32,736
Thailand	5,797	—	15,688	—	—
Other Countries	—	—	—	111	2
Total	144,987	97,115	122,808	207,237	247,961(1)

1. May not add to total because of independent rounding.

Source: U.S. Bureau of Mines

TABLE XIII. SLAB ZINC GENERAL IMPORTS
(Tons of 2,000 lbs.)

	1975	1976	1977	1978	1979
Algeria	—	999	1,278	2,808	5,750
Angola	5,512	—	—	—	—
Australia	22,875	32,586	29,262	38,344	37,173
Belgium-Luxembourg	19,084	35,473	42,971	21,181	18,242
Canada	181,692	313,006	239,555	288,631	286,096
China, Peoples Republic of	298	2,532	1,109	883	229
Finland	19,157	31,526	32,669	36,337	23,244
France	1,837	10,397	17,427	25,159	14,818
Germany, Federal Rep. of	17,827	48,665	41,552	40,736	21,064
Italy	7,299	30,739	21,602	12,290	6,054
Japan	7,202	9,483	14,353	9,485	11,152
Korea, Republic of	—	—	—	4,409	2,535
Liberia	3,601	—	—	—	—
Mexico	17,605	62,638	29,981	56,737	43,357
Netherlands	15,123	9,642	6,424	11,130	3,504
Norway	—	1,102	—	—	—
Peru	19,128	19,911	18,885	11,293	8,150
Poland	440	1,118	3,941	6,250	110
South Africa, Republic of	2,077	3,650	5,885	8,942	—
Spain	26,268	29,687	28,339	66,387	73,567
United Kingdom	2,200	1,820	1,643	1,099	2,626
Yugoslavia	7,009	29,869	3,574	4,163	—
Zaire	4,158	36,922	35,707	28,252	16,402
Zambia	—	2,649	579	2,870	5,518
Other	45	175	—	3,665	1,554
Total	380,437	714,489	576,736	681,051	581,148(1)

1. Total may not add because of independent rounding.

Source: U.S. Bureau of Mines

ZINC IN AUSTRALIA 1979

Dr. B.S. Hickman, Director
Australian Zinc Development Association
Melbourne, Australia

Australian primary zinc sales in 1979 were 97,258 tonnes, an increase of 11.1% from 1978 sales of 87,505.

PRIMARY ZINC SALES IN AUSTRALIA BY END USES
(metric tons)

End Use	1978	1979
Galvanizing		
General	11,840	13,126
Sheet	30,363	36,678
Wire	6,562	7,555
Pipe & Tubes	8,126	10,300
Total	56,891	67,659
Brass	8,541	8,557
Diecasting	9,533	9,051
Rolled Zinc	2,649	2,680
Zinc Dust	3,185	2,785
Zinc Oxide	4,727	4,261
Miscellaneous	1,979	2,265
Total	30,614	29,599
GRAND TOTAL	87,505	97,258

Zinc sales showed a general improvement in most end use areas compared to the previous year. Significant increases occurred in all galvanizing categories, with pipe galvanizing showing an increase of 26.8%, sheet an increase of 17.2%, wire an increase of 15.1% and general an increase of 10.9%.

ZINC IN CANADA 1979

M.J. Gauvin
Energy, Mines and Resources Canada
Ottawa, Ontario

Canada is the world's largest producer and exporter of zinc and about 25 per cent of Western world demand is supplied by Canadian mines. Canadian consumption of zinc is about 10 per cent of its production, the balance of Canadian production being sold on foreign markets. Refining capacity in Canada of 710,000 tons is sufficient to process about one-half of domestic mine production to refined metal. In response to improved demand Canadian refined metal production in 1979 was at an all-time high of 639,835 tons.

Consumption in 1979 is estimated to be 169,000 tons, an increase of 5 per cent over 1978. This growth continued to be broadly based and at least in part, a reflection on the fact that the devalued Canadian dollar enabled manufacturers of zinc products to be more competitive in foreign markets. Higher metal shipments during the year to consumers at home and abroad reduced inventories of refined metal. Mine production declined about 8 percent from 1978 and all production was contracted for sale or processed domestically.

CANADIAN ZINC PRODUCTION AND SHIPMENTS
(Tons of 2,000 lbs.)

	Production		Shipments (Refined Primary Metal)			
Year	Mine Output	Refined Primary Metal	Within Canada	To U.S.A.	To Other Countries	Total
1974	1,330,331	482,509	148,403	259,641	67,423	475,467
1975	1,355,269	470,630	149,460	182,251	75,768	407,479
1976	1,262,161	520,639	146,793	300,013	95,263	542,069
1977[r]	1,433,256	545,521	144,007	228,531	93,499	466,037
1978	1,372,651	546,107	159,548	268,178	216,354	644,080
1979[p]	1,268,426	639,835	169,474	283,862	179,080	632,416

[r] revised; [p] preliminary.

CANADIAN CONSUMPTION OF PRIMARY ZINC
(Tons of 2,000 lbs.) [1]

	Galvanizing	Casting	Brass	Other	Total
1974	70,000	30,500	15,500	24,000	140,000
1975	65,000	26,600	10,000	20,700	122,300
1976	66,000	28,800	12,400	22,400	129,600
1977	68,000	28,000	13,000	23,000	132,000
1978	77,038	15,635	7,522	24,168	124,363
1979	n.a.	n.a.	n.a.	n.a.	169,000[p]

1) Data from 1974 to 1977 inclusive are Zinc Institute estimates. Data for 1978 are from Statistics Canada which does not include a number of small consumers.

[p] preliminary

ZINC IN FINLAND 1979

(As Reported by Outokumpu Oy)
Helsinki, Finland

1979 was a record year for zinc consumption in Finland. The total consumption was 23,020 tons, which is 13.5% more than in 1978.

Consumption of Slab Zinc by End Users in Finland
(metric tons)

	1978	1979
Galvanizing		
General	3,490	3,500
Sheet	10,170	12,190
Wire	740	830
Total	14,400	16,520
Brass	2,850	3,000
Diecasting	630	900
Others	2,400	2,600
Total	5,880	6,500
Grand Total	20,280	23,020

ZINC IN FRANCE 1979

P. de Puyraimond
Centre Technique du Zinc et de ses Alliages
Levallois, France

Raw zinc consumption increased markedly in France in 1979. It amounted to 286,739 tons against 281,717 tons in 1978, i.e. an increase of 1.8%.

Unfortunately, a certain overproduction prevented the zinc price from increasing sufficiently: from $720 at the beginning of the year, the price reached $845 in May and dropped again in August to reach $780, price still actual at the end of the year.

The estimates for 1980 are not very optimistic and plants will go on working under their capacity. The estimated French production amounts only to 243,000 tons.

Production of raw slab zinc amounted in 1979 to 248,616 tons, i.e. 17,410 tons (7.53%) more than in 1978 and 10,345 tons (4.34%) more than in 1977.

FRENCH RAW SLAB ZINC PRODUCTION
(metric tons)

	1977	1978	1979
Pure and extra pure zinc	172,821	168,484	182,398
Ordinary zinc	65,450	62,713	66,218
	238,271	231,197	248,616

FRENCH RAW SLAB ZINC CONSUMPTION
(metric tons)

	1977	1978	1979
Production	238,271	231,197	248,616
+ Imports	58,292	80,542	79,386
	296,563	311,739	328,002
− Exports	34,127	43,355	39,715
− Stocks G I R M	—	—	—
Apparent French consumption	262,436	268,384	288,287
Incidence of the increase in producers' stocks		+ 13,333	
Incidence of the decrease in producers' stocks	− 4,707		− 1,548
	257,729	281,717	286,739

It is to be noted that the General Management of the Custom Department registered, by mistake, under the item "Zinc Alloys" certain tonnages of zinc containing a very small amount of aluminum and which, therefore, are not included in the above figures; they should, however, be taken into account and the French consumption should be increased as follows:

—1977 by 6,665 tons
—1978 by 1,057 tons

DISTRIBUTION TO USERS (FRENCH PRODUCTION)
(metric tons)

	1977		1978		1979	
	tons	%	tons	%	tons	%
Galvanizing	79,985(1)	31.04	93,864(2)	33.32	97,961	34.16
Rolled zinc	89,328	34.66	96,995	34.43	108,189	37.73
Alloys[3]	37,355	14.49	35,718	12.68	33,736	11.77
Brass[3]	32,511	12.62	29,500	10.47	25,030	8.73
Zinc Oxide[4]	7,299	2.83	11,712	4.16	7,340	2.56
Wire for Spraying	4,470	1.73	5,168	1.83	5,601	1.95
Miscellaneous	6,781	2.63	8,760	3.11	8,882	3.10
	257,729	100%	281,717	100%	286,739	100%

(1) This figure is to be increased by 6,665 tons for the above explained reasons.
(2) The increase in 1978 amounts to 1,057 tons.
(3) Zinc content
(4) It should be noted that raw zinc is only one of the raw materials used for zinc oxide production which amounted to 45,416 tons in 1979 against 46,975 tons in 1978 and 44,948 tons in 1977 (corrected figures for 1977).

ROLLED ZINC

The French consumption of rolled zinc for the last three years was as follows:

French Consumption of Rolled Zinc
(metric tons)

	1977	1978	1979
Production	87,302	96,763	106,017
+ Imports	11,136	11,579	12,311
	98,438	108,342	118,328
− Exports	28,011	40,434	39,797
Apparent French consumption	70,427	67,908	78,531
Incidence of the increase in producers' stocks		+ 4,063	
Incidence of the decrease in producers' stocks	− 1,070		− 5,137
	69,357	71,971	73,394

French consumption of rolled zinc increased in 1979 by 1,423 tons (1.98%) compared to 1978 and by 4,037 tons (5.82%) compared to 1977.

Building Industry

The building industry remains the most important market. The study of the French consumption in the building field, compared to the total consumption (building + industry), was as follows:

1977	1978	1979
83.69%	86.98%	85.94%

GALVANIZING

The French galvanizing industry consumed 98,900 tons.

Distribution of the galvanizing consumption may be assessed approximately as follows:

French Galvanized Consumption
(metric tons)

	1978*	1979
Sheet	40,700	45,200
Tubes	5,900	5,900
Wire	13,800	14,200
General galvanizing	37,300	33,600
	97,700	98,900

*The figures for 1978 were rectified compared to those published.

Galvanized Strip

The French industry of galvanized strip had a satisfactory activity in 1979 and achieved relatively good results, as well on the domestic as the international level.

The following figures will provide a general view of this activity in the last six years. (Table including galvanized strip, precoated galvanized sheet, etc.)

French Galvanized Strip Production
(thousands of metric tons)

	1974	1975	1976	1977	1978	1979	1974-79
French production	808	527	702	734	851	938	+ 16
French consumption	604	462	570	615	624	711	+ 18
including imports	100	120	156	177	183	202	+100

It should be noted that the domestic consumption increased by 14% in 1979 compared to 1978; this fact is due to French supplies (+15%), but also to an increase in imports (+10%). It is also to be stressed that the volume of imports doubled between 1974 and 1979 while French supplies increased only by 1%.

The following table shows the evolution of French supplies of galvanized and precoated products between 1978 and 1979:

French Galvanized and Precoated Products
(thousands of metric tons)

	Galvanized		Precoated	
	1978	1979	1978	1979
Ironmongers	131	155	7	8
Profiles	63	78	15	24
Ripped strip	68	71	8	9
Metal work	18	23	5	5
Mechanics	11	11	5	6
Agricultural machinery	3	4	—	—
Appliances	5	7	1	1
Automobile	19	19	1	1
Steel structures	25	26	17	14
Miscellaneous	15	29	3	3
	358	423	62	71

Galvanized tubes

Deliveries of galvanized tubes amounted to 47,000 tons in 1979 against 41,600 tons in 1978, i.e. an increase of 13%; in 1978, there had been an increase of 5.3% against 1977.

Proportion of galvanized tubes in a same class of tubes was 33.6% (against 33.7% in 1978). For exported tubes, the proportion amounted to 50.8% (against 45.6% in 1978).

Galvanized wire

The total of deliveries of galvanized wire in 1979 increased slightly compared to the preceding year:

French Deliveries of Galvanized Wire
(metric tons)

	1978	1979
MILD STEEL		
Galvanized wire	105,210	110,487
Chain link fencing (one turn)	52,880	55,295
Chain link fencing (hexagonal mesh)	15,260	14,398
All other fences and fringes	47,680	54,698
Barbed wire	21,890	21,688
Other products	6,990	7,406
Total of galvanized products	249,910	263,922
Total of all mild steel products	839,860	824,495
HARD STEEL		
Galvanized wire	29,930	24,852
Cables and cable cores	26,090	21,700
Fences	4,420	3,820
Total of galvanized products	60,440	50,372
Total of all hard steel products	250,570	239,424

General galvanizing (jobbing)

Consumption for general galvanizing decreased slightly in 1979, due to the decrease on the market for power transmission poles which could not be counterbalanced by the developments in other fields.

However, after the decrease in 1978 and 1979, a slight increase in general galvanizing is to be anticipated because of the necessity of finding a good and economic protection against corrosion.

During 1979, several industrial trials were carried out with Polygalva to ascertain its characteristics and possibilities for galvanizing all types of steels and especially silicon containing steels.

ALLOYS

Consumption in France of zinc alloys increased in 1979, amounting to 52,200 tons against only 49,670 tons in 1978, i.e. an increase of 5%.

The Zamak alloys represent the most important part of this consumption: 51,300 tons, compared to 900 tons for all other zinc alloys and especially ILZRO 12 and Kayem, both gravity cast.

Of the above mentioned figures, French producers delivered 33,650 tons, the balance, i.e. 18,600 tons being imported. French zinc alloy exports represented only 2,214 tons in 1979.

The increase in the 1979 consumption is due mainly to the satisfactory activity of the most important zinc die casting consuming industries: automotive industry, hardware, electric appliances, sporting goods and toys.

BRASS

Copper alloys containing zinc (about 30-40%) are divided up into two classes: wrought products (bars, tubes, wire and rolled brass) and cast products.

The latter represented in 1979 a little more than 11,000 tons, i.e. a slight increase compared to 1978.

French Cast Brass Production
(metric tons)

	1978	1979
Sand and mould cast	8,859.4	9,052.2
Pressure die cast	1,920.3	2,242.2

As concerns wrought brass, the following table shows the French productions in 1979 and their variation compared to those in 1978:

French Wrought Brass Production
(metric tons)

Rolled brass	40,930	+ 4%
Wire	8,960	+38%
Bars	114,840	+11%
Tubes	5,760	−10%

ZINC WIRE

Production of zinc wire for spraying amounted to 5,680 tons in 1979 against 5,274 tons in 1978 and 4,521 tons in 1977.

ZINC DUST

Production of zinc dust amounted to 8,794 tons in 1979 against 8,206 tons in 1978 and 10,076 tons in 1977.

ZINC IN INDIA 1979

L. Pugazhenthy
Technical Officer
Indian Lead Zinc Information Centre
New Delhi, India

1979 witnessed a further boost in zinc production; the ingot production at 63,315 tonnes was 6.6% more than that in 1978. The production could have been much higher but for the severe power cuts and, to some extent, labour unrest both of which cut down the indigenous production.

Consumption of zinc during 1979 stood at approximately 125,000 tonnes against 105,000 tonnes in the previous year, an increase by about 19%.

The deficit between consumption and production was met by importation which would have been around 65,000 tonnes.

The metal application, sectorwise, must have been in the following order: Galvanizing 63%, Drycells 13%, Alloys and semis 10%, Zinc oxide 5%, Die Casting 4%, Zinc Dust 4%, Chemical and miscellaneous industries 1%. Galvanizing, the major market, was affected considerably by nonavailability of required steels. The export of steel pipes and tubes, galvanized and black, crashed by 50% during 1979-80.

Cadmium production amounted to 166 tonnes.

As for the future, one can look ahead with great hopes in view of two interesting developments. One of them is the signing of an agreement by Hindustan Zinc Ltd., with a Finnish firm for a leach residue treatment plant which will increase the overall zinc recovery from the present level of 84% to 93%. HZL has also entered into an agreement with a Japanese company to obtain knowhow and basic engineering for recovering silver from its Debari smelter. About 8.5 tonnes of silver valued at Rs.20 million will be recovered every year. Both the plants are likely to be commissioned during 1983-84. The other relates to Cominco Binani Zinc's plans for optimisation and expansion programme to bring up the installed capacity to 20,000 tonnes per annum by 1982-83. During 1980-81, Hindustan Zinc plans to produce 66,000 tonnes of zinc and there may be a higher output from the other smelter, CPBE. There will be an increase in zinc consumption too.

ZINC IN JAPAN 1979

Hiroshi Tanaka, Director General
Japan Lead Zinc Development Association
Tokyo, Japan

Production of zinc during 1979 showed an increase and amounted to 789,000 metric tons, an increase of 11,000 tons compared with 1978.

But, due to the decline of demand since the oil shock, all zinc smelters in Japan have been in the condition of curtailment of production by 30% of full capacities.

PRODUCTION OF SLAB ZINC
(in 1,000 metric tons)

1975	1976	1977	1978	1979
698	742	778	768	789

Demand for sheet galvanizing, galvanized steel structure and general small parts are increasing in Japan, by the rust purge campaign which our association is carrying on.

CONSUMPTION OF SLAB ZINC
(in 1,000 metric tons)

Reported consumption Uses	1975	1976	1977	1978	1979
Sheet galvanizing	214	273	265	298	319
General galvanizing	93	109	106	115	123
Brass, bronze, etc.	73	100	92	99	99
Die casting	82	117	112	106	119
Others	85	97	92	98	94
Total	547	696	667	716	754

ZINC IN MEXICO 1979

Centro Mexicano de Informacion de Zinc y Plomo A.C.
Sonora, Mexico

The following charts show that production of zinc in Mexico in 1979 was 159,602 metric tons, which compares with 1978's 172,233 metric tons as a reduction of 7.34%. National consumption grew from 79,166 metric tons in 1978 to 83,310 in 1979. This 5.23% increase of 4,144 metric tons was located primarily in the galvanizing and die casting industries. Exports diminished from 98,828 metric tons in 1978 to 76,140 metric tons in 1979. This reduction of 30% was due chiefly to the contraction of international markets, where, over the past few years, supply has exceeded demand.

Mexican Production
(metric tons)

1978	172,233
1979	159,602

Mexican Consumption by End-Use
(metric tons)

	1976	1977	1978	1979
Galvanizing	18,651	19,356	26,740	31,617
Die Casting	8,444	7,338	11,541	16,279
Zinc Oxide	8,390	15,186	17,939	12,837
Small Batteries	5,311	5,976	6,801	7,746
Other	17,734	16,365	16,145	14,831
Total	58,530	64,221	79,166	83,310

ZINC IN SCANDINAVIA 1979

Magnus Blomkvist
Scandinavian Lead Zinc Association
Stockholm, Sweden

Scandinavian Zinc Production and Consumption
(in 1,000 metric tons)

	1977	1978	1979 Preliminary
Mine production	246.4	274.8	280.3
of which:			
Denmark (Greenland)	76.6	82.4	87.3
Norway	29.6	29.6	28.6
Sweden	140.2	162.8	164.4
Smelter production	69.4	71.3	77.5
of which:			
Denmark	—	—	—
Norway	69.4	71.3	77.5
Sweden	—	—	—
Consumption of slab zinc by ends uses:			
Sheet galvanizing	10.1	10.8	11.6
General galvanizing	32.0	35.6	33.5
Brass	9.8	10.5	10.5
Die casting	7.0	7.2	8.2
Others	8.0	8.1	10.2
Total	66.9	72.2	74.0
of which:			
In Denmark	15.9	15.4	17.1
In Norway	16.5	17.4	15.3
In Sweden	34.5	39.4	41.6

ZINC IN SPAIN 1979

V.R. Pena, Director
Asociacion Tecnica Española Para el Desarrollo del Zinc
Madrid, Spain

The production of zinc in Spain during 1979 rose to 186,042 metric tons, thus showing an increase of 18,569 tonnes compared with the previous year. The tonnages of slab zinc, percentages, and variations during 1978 and 1979 are shown in the following table:

TABLE I
PRODUCTION OF SLAB ZINC
(metric tons)

Grade	1978	%	1979	%	Variation 1979/1978
Pure and Extra Pure Zinc	153,406	91.60	180,567	97.06	+ 17.7
Ordinary Zinc	14,067	8.40	5,475	2.94	− 67.1
Total	167,473	100.0	186,042	100.0	+ 11.1

Table II gives a breakdown of the domestic consumption of raw slab zinc for the main end uses 1978-1979.

TABLE II
CONSUMPTION OF SLAB ZINC
(metric tons)

End Uses	1978	1979
Galvanizing		
General	14,104	13,474
Tube	9,015	8,575
Wire	5,397	4,611
Sheet and strip	13,342	15,457
Total	41,858	42,117
Brass	18,430	15,549
Rolled Zinc	8,709	8,012
Die Casting	23,770	22,836
Zinc Oxide	5,200	2,865
Zinc Dust	2,957	3,631
Cathodic Protection	1,303	815
Anodes for Electroplating	1,105	1,076
Miscellaneous	1,274	941
Total	62,748	55,722
GRAND TOTAL	104,606	97,839

In 1979 the consumption of primary zinc ingots rose to 97,839 metric tons, which is 6,767 metric tons less than the previous year (104,606 tonnes); that is to say, there was a variation of −6.5%.

The total consumption of zinc alloys during 1979 reached 23,575 tonnes; of this total, 12,028 tonnes were alloys with copper, and 11,547 tonnes were alloys without copper, which respresent 51.0% and 49.0% respectively of the total zinc alloys. The variations as compared with 1978 are, respectively, +2.5% and −8.4%. The total variation, compared with the previous year is −3.1%.

Rolled zinc during 1979 reached 8,012 metric tons. This represents a variation of −8.1% compared with 1978. The breakdown is as follows: Rolled for building, 3,329 tonnes (41.5%); for dry cells, 4,267 tonnes (53.3%); for printing plates, 138 tonnes (1.7%); and miscellaneous, 278 tonnes (3.5%).

Zinc dust consumption rose to 16,777 metric tons. This represents a variation of +19.5% compared with the year 1978. The breakdown for zinc dust is as follows: chemical industry, 2,997 tonnes; purification 13,296 tonnes; and zinc-rich paint, 484 tonnes, which represent a percentage of 17.8%, 79.3%, and 2.9% respectively.

The consumption of zinc oxide during 1979 obtained from slab zinc rose to 2,865 metric tons. The consumption of zinc oxide reclaimed from dross, scrap, and wastes is estimated for 1979 to reach 10,000 metric tons.

The most important zinc consumptions have been: galvanizing, die casting, brass and zinc dust.

Given the present economic conditions, it is difficult to establish a forecast of zinc consumption for 1980. Nevertheless, it is felt that the traditional sectors of high zinc consumption (galvanizing, die casting, brass, etc.) will continue at a similar rate to that of 1979.

ZINC IN THE UNITED KINGDOM 1979

A.R.L. Chivers
Zinc Development Association
London, England

Total zinc consumption in the United Kingdom in 1979 was 311,700 tonnes, 8,000 tonnes less than in 1978, i.e. back to the 1976 level. The breakdown of end-uses was very similar to that in 1976 except that a big increase in consumption for strip galvanizing, 34,200 tonnes compared with 25,800 tonnes in 1976, was offset by smaller reductions in brass and zinc oxide. Consumption of slab zinc amounted to 238,800 tonnes, about 9,000 tonnes below the previous year's figure. Consumers' stocks at the end of the year were 21,800 tonnes, 1,500 tonnes down over the year.

Compared with 1978, general, wire and tube galvanizing were each down by a few percent, while strip galvanizing rose by over 20 percent. The large increase was due to the domestic producer increasing its share of the market at the expense of imported galvanized strip. The set-back in the other uses of galvanizing was due to the general recession in UK industry, particularly in construction and heavy engineering. The 7 percent drop in zinc for brass reflected the low rate of building construction, plumbing and electrical fittings being an important market. Rolled zinc was about 10 percent below the previous year. The strip and sheet rolled in the United Kingdom are used mainly for dry cell batteries, with some for printing plates. Wide strip is all imported and so does not appear in these figures.

The total production of die casting alloys was down by about 6 percent, but this does not necessarily reflect the output of die casters, as alloys are both imported and exported. In fact die casting production was 53,600 tonnes according to the best estimates. The 10 percent fall compared with 1978 was mainly in the output of captive plants in the automotive industry, due to lower car production rather than substitution.

Zinc oxide production was static and that of zinc dust lost most of the previous year's gain.

Slab zinc production was 4 percent up at 76,700 tonnes and a greater tonnage of the ISF production was refined to a higher purity. UK zinc production is based on imported concentrates and in 1979 Australia was the biggest supplier at 30,500 tonnes, compared with 13,400 tonnes in 1978 and only 1,000 tonnes in 1977. Peru, the Irish Republic, the United States, Canada and Iran supplied another 60,000 tonnes, out of the total 98,400 tonnes (zinc contents). Total imports of slab zinc were 175,900 tonnes, about 5,000 tonnes down. Canada, the Netherlands, Finland and Norway were the biggest suppliers, with individual tonnages little changed from 1978. Exports of slab zinc from the UK fell by about 3,500 tonnes to 11,100 tonnes.

TABLE I
UK CONSUMPTION OF ZINC IN ALL FORMS 1973-1979
(in 1,000 metric tons)

End Uses	1973	1974	1975	1976	1977	1978	1979
Galvanizing							
General	36.5	35.4	34.0	35.9	34.1	35.7	34.4
Sheet and Strip	36.2	32.8	16.8	25.8	23.8	27.3	34.2
Wire	19.6	17.7	16.7	15.8	15.8	15.8	14.7
Tube	9.8	6.4	6.6	6.4	7.2	6.4	5.9
Galvanizing Total	102.1	92.3	74.1	83.9	80.9	85.2	89.1
Brass	112.6	100.6	76.1	83.8	87.5	86.7	81.6
Rolled Zinc	28.9	22.2	17.4	20.6	23.4	23.2	20.6
Zinc Die Castings	79.6	69.8	52.2	61.9	62.7	65.9	62.1
Zinc Oxide	42.3	38.3	28 7	33.7	32.4	29.8	29.9
Zinc Dust	14.8	14.5	12.8	11.4	12.6	13.5	12.9
Miscellaneous	14.7	15.4	14.9	15.3	15.6	15.6	15.4
Total	395.0	353.1	276.2	310.6	315.1	319.9	311.7
of which slab zinc	305.4	268.5	207.1	242.8	244.8	247.6	238.8

TABLE II
UNITED KINGDOM SLAB ZINC SUPPLIES 1973 - 1979
(in 1,000 metric tons)

	1973	1974	1975	1976	1977	1978	1979
Production	83.8	84.4	53.4	41.6	81.5	73.6	76.7
(of which high purity)	26.9	29.9	14.7	6.6	27.3	23.4	25.3
Imports	219.7	195.5	192.2	193.9	198.0	181.6	175.9
of which purity: min. 99.99	86.4	129.5	112.7	72.7	76.3	87.7	97.8
Electro min. 99.95	71.3	47.6	47.1	84.3	93.2	67.9	52.8
GOB min. 98.5	62.1	18.4	32.4	36.9	28.5	26.0	25.4
of which from							
Australia	34.7	13.9	17.2	5.5	4.8	1.2	1.5
Belgium	9.9	17.8	13.0	6.9	7.3	3.5	8.5
Canada	59.8	29.3	60.0	40.9	47.8	47.3	45.7
Finland	35.4	42.8	25.6	29.1	25.3	37.0	36.6
Germany FR	27.3	11.8	8.1	6.0	13.8	11.4	7.8
Netherlands	6.6	46.7	42.9	75.7	50.5	45.2	43.5
Norway	13.2	10.8	6.3	8.4	15.1	14.8	15.1
Exports & Re-exports	20.1	7.9	13.4	7.3	17.1	14.6	11.1

Review of Cadmium in the United States in 1979

TABLE I. SALIENT STATISTICS OF CADMIUM
(in tons of 2,000 lbs.)

	1978	1979
Stocks of metal beginning of period:		
Metal producers	1601	1270
Compound producers	80	50
Distributors	281	326
Production (Primary and Secondary)[1]		
Metal	1822	2009
Sulphide[2]	769	1648
Other compounds[3]	780	1737
Shipments[4]		
Metal (includes secondary)	2157	2613
Compounds	1623	1978
Imports (general)		
Metal	3175	2835
Exports	360	233
Stocks of metal end of period		
Metal producers	1270	558
Compound producers	50	57
Distributors	326	376

1. Includes equivalent metal content of cadmium sponge used directly in production of compounds.
2. Includes cadmium lithopone and cadmium sulfoselenide.
3. Includes plating salts and oxide.
4. Shipments include internal plate consumption.

Source: U.S. Bureau of Mines.

The U.S. Bureau of Mines estimates 1979 cadmium consumption in the United States at 5,429 short tons, a 9% increase over 4,971 tons in 1978. Use of cadmium increased in all end-use categories except transportation (see Table II): transportation (down 14%), coating and plating (up 9%), batteries (up 9%), pigments (up 9%), plastics and synthetic products (up 8%) and other (up 20%) which includes cathode-ray phosphors, catalysts, nuclear reactor control, fire detection devices, solar photovoltaics, alloys and solders.

Production of metal, both primary and secondary, rose 10% from 1,822 tons in 1978 to 2,009 tons in 1979. The deficit between production and consumption was made up through 2,835 tons of imported metal. Major importers of cadmium metal were Canada, Australia, Mexico, and Belgium-Luxembourg. St. Joe Zinc's closure of its Monaca, Pennsylvania zinc smelter in December 1979 will affect U.S. cadmium smelting capacity.

The U.S. government stockpile goal of cadmium remained at 12,350 tons with 3,165 on hand.

Producer prices for cadmium remained at $2.25 to $2.50 per pound from January until April 1979 when they reached a high of $2.75 to

$3.25. Prices levelled off to $2.50 from August through December and closed the year at $2.50-$2.75.

Electroplating continues to be cadmium's major market. Although there has been growing concern over cadmium toxicity in scrap metals, cadmium is expected to remain in demand in plating since it has certain corrosion protection qualities that cannot be readily replaced by other metals. Markets for cadmium in batteries, pigments, and synthetic materials will continue to grow. Cadmium sulphide solar cells represent a major potential market for cadmium.

U.S. imports and exports of cadmium, world production of refined cadmium and world consumption of cadmium are detailed in Tables III through VI.

TABLE II. CADMIUM CONSUMPTION (ESTIMATED)
(in tons of 2,000 lbs.)

	1975	1976	1977	1978	1979
Transportation[1]	595	1003	761	849	726
Coating & Plating	904	1995	1521	1687	1841
Batteries	452	1300	981	1091	1191
Pigments	595	739	573	650	705
Plastics & Synthetic Products	551	661	507	551	595
Other[2]	244	233	137	143	171
	3341	5931	4480	4971	5429

1. Includes coating and plating of aircraft and vehicles
2. Includes cathode-ray phosphors, catalysts, nuclear reactor control, fire detection devices, solar photovoltaics, alloys and solders

Source: U.S. Bureau of Mines.

TABLE III U.S. IMPORTS OF CADMIUM METAL
(in tons of 2,000 lbs.)

	1975	1976	1977	1978	1979
Algeria	—	—	—	22	—
Australia	398	421	448	448	352
Austria	5	—	—	6	—
Belgium-Luxembourg	603	279	246	322	262
Brazil	6	—	—	—	—
Canada	280	1052	471	735	766
Congo (Brazzaville)	17	—	—	—	—
Denmark	—	—	—	—	6
Finland	4	43	131	91	142
France	81	130	13	62	110
Germany, Fed. Rep.	225	133	44	101	23
India	—	40	6	9	—
Italy	—	32	—	7	—
Japan	—	—	—	5	11
Korea, Rep. of	55	110	105	266	220
Mexico	214	394	436	481	317
Netherlands	67	52	122	88	114
Norway	—	—	—	6	118
Peru	178	95	90	143	156
Poland	17	—	—	—	—
Portugal	—	—	—	—	8
Spain	119	39	63	179	65
Sweden	—	—	22	53	25
United Kingdom	55	11	6	18	25
U.S.S.R.	—	193	—	—	—
Yugoslavia	77	322	351	110	90
Zaire	216	66	17	39	28
Total	2,617	3,412	2,571	3,185	2,838

Source: U.S. Bureau of the Census

TABLE IV. EXPORTS OF CADMIUM METAL
(in tons of 2,000 lbs.)

1975	198
1976	252
1977	118
1978	360
1979	233

Source: U.S. Bureau of the Census

TABLE V. WORLD PRODUCTION OF REFINED CADMIUM
(metric tons)

	1975	1976	1977	1978	1979
Production					
Europe					
Austria	30	29	26	33	34
Belgium	950	1,196	1,434	1,139	1,409
Finland	217	426	527	611	588
France	602	586	790	689	792
Germany Federal Republic	923	1,275	1,335	1,181	1,183
Italy	421	439	448	378	510
Netherlands	272	398	302	402	416
Norway	48	81	97	120	113
Spain	205	246	303	253	222
United Kingdom	275	190	295	291	425
Yugoslavia	150	160	189	185	195
Total	4,093	5,026	5,746	5,282	5,887
Africa					
Algeria	100	29	133	100	100
Namibia	—	83	88	79	81
Zaire	264	266	246	186	240
Zambia	6	7	5	—	—
Total	370	385	472	365	421
Asia					
India	53	34	44	113	168
Japan	2,688	2,532	2,844	2,531	2,594
Turkey	—	—	20	15	12
S. Korea	—	—	20	40	42
Total	2,741	2,566	2,928	2,699	2,816
America					
Canada	1,140	1,342	1,376	1,270	1,460
Mexico	577	680	726	897	921
Peru	144	174	182	170	
U.S.A.	2,055	2,150	2,188	1,708	2,057
Other America	64	54	65	50	60
Total	3,980	4,400	4,537	4,095	4,498
Australia	642	648	671	754	803
Total	11,727	13,025	14,354	13,195	14,425
Other countries					
Bulgaria	220	220	200	210	210
Germany, D.R.	18	18	18	18	18
Roumania	88	100	90	90	90
Poland	370	400	380	370	380
U.S.S.R.	2,950	2,900	2,900	3,000	2,900
China	200	200	200	220	200
N. Korea	150	150	150	150	150
Total	3,996	3,988	3,938	4,058	3,948
World total	15,723	17,013	18,292	17,253	18,373

Source: World Bureau of Metal Statistics

TABLE VI. WORLD CONSUMPTION OF CADMIUM
(metric tons)

	1975	1976	1977	1978	1979
Consumption					
Europe					
Belgium	1,036	1,735	1,636	1,464	1,551
France	825	958	1,200	1,085	1,017
Germany, Federal Republic	1,139	2,100	1,892	1,836	2,048
Italy	360	360	380	450	605
Sweden	264	403	270	132	267
United Kingdom	1,032	1,414	1,242	1,354	1,445
Other Europe	350	336	346	391	381
Total	5,006	7,306	6,966	6,712	7,314
Asia					
India	120	96	110	70	99
Japan	444	1,181	771	1,131	1,275
Other Asia	116	250	250	120	184
Total	680	1,527	1,131	1,321	1,558
Africa	10	12	12	13	12
America					
Brazil	200	200	120	65	65
Canada	38	54	50	50	50
U.S.A.	3,047	5,640	4,094	4,546	5,278
Other America	43	20	25	35	31
Total	3,328	5,914	4,289	4,696	5,424
Australia	133	174	140	113	140
Total	9,157	14,933	12,538	12,855	14,448
Czechoslovakia	307	251	279	280	279
Germany D.R.	450	460	450	480	460
Poland	240	200	200	220	210
U.S.S.R.	2,200	2,300	2,400	2,500	2,300
Other Countries	200	210	380	450	310
Total	3,397	3,421	3,709	3,930	3,559
World total	12,554	18,354	16,247	16,785	18,007

Source: World Bureau of Metal Statistics

SUPPORTING COMPANIES—ZINC INSTITUTE INC.

Full Members

Amax Lead & Zinc, Inc.
ASARCO Incorporated
Australian Mining & Smelting Co. Ltd.
Ball Corporation,
Metal & Chemical Division
Billiton International Metals, B.V.
The Broken Hill Associated Smelters Pty.
The Bunker Hill Company
Certified Alloys Company
Eagle-Picher Industries, Inc.
Eastern Alloys, Inc.
Electrolytic Zinc Company of
Australasia, Ltd.
Homestake Mining Company
Hudson Bay Mining & Smelting Co. Ltd.
Industrial Minera Mexico
Metallgesellschaft A-G
National Zinc Company
Noranda Sales Corp., Ltd.
Outokumpu Oy
Ozark Lead Company
The Pigment & Chemical Co., Ltd.
Sandoval Zinc Company
Texasgulf Inc.

Contributing Members

Exxon Minerals Company, U.S.A.
Penoles Metals & Chemicals, Inc.
St. Joe Zinc Company

Associate Members

Associated Metals & Minerals Corp.
T.L. Diamond & Company, Inc.
M.M.C. Corporation
Mitsui Mining & Smelting Co. Ltd.
Preussag Aktiengesellschaft
Societe Generale Des Minerais

Zinc Institute Incorporated, a non-profit organization is the trade association of the zinc industry of the United States and Canada with substantial support from producers in other countries of the world, as well as fabricators and consumers. The Institute does not produce or sell zinc but collects and distributes information relative to the uses of this metal wherever required. Sources of information are its own files and experience, close industry contact and research. Its programs are conducted by means of consultation, educational campaigns, publications, motion pictures, industrial advertising and technical and general publicity.

The services and publications of the Zinc Institute are available without charge to anyone interested in the utilization of zinc, zinc containing, or zinc-coated products.

Its programs are funded primarily through the voluntary acceptance by producers of assessments against their sales in the United States and Canada.

All data presented herein are in short tons unless otherwise specified. Short tons are converted to metric tons by multiplying by 0.907185. To convert metric to short tons multiply by 1.10231.